CLEARINGHOUSE

MEDICAID QUALITY CONTROL

DATA ANALYSIS

SECTION 5000

DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
HEALTH CARE FINANCING ADMINISTRATION
MEDICAID BUREAU
DIVISION OF QUALITY CONTROL
NOVEMBER 1978

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5100 INTRODUCTION

5110 Data Analysis Requirements

The Medicaid Quality Control (MQC) system is an important management tool that will help the State Title XIX Agency monitor and improve the administration of its Medicaid program. It is specifically designed to assist program administrators in identifying areas where Medicaid funds are being misspent and in taking steps to correct deficiencies. Properly implemented, the MQC system will provide each State with accurate data for corrective action planning.

The MQC system is based on a review of a statistically valid sample of Medicaid cases. These reviews cover three important functions of the Medicaid program: Eligibility, Claims Processing, and Third-Party Liability. The data collected through the review process must be organized, processed and analyzed to provide a clear and concise picture of the operations of the Medicaid program.

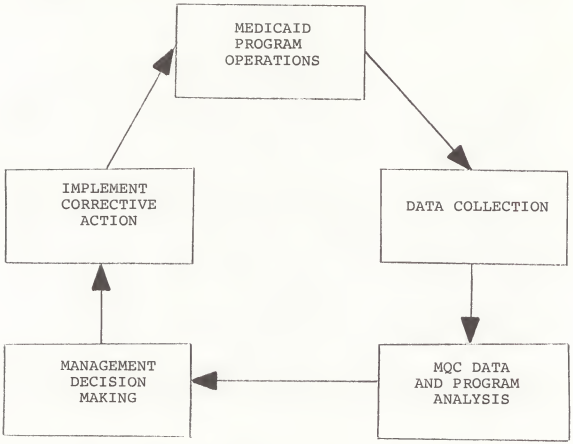
Thorough and accurate analyses are the basis for formulating corrective actions to effectively reduce error rates and the amount of dollars misspent. The State personnel responsible for data analysis must first make use of technical formulae and computations in the data analysis process. The analysis must be presented to program managers in a form that helps them decide among alternative approaches to corrective action. Data analysis and its relationship to overall program operations and management is illustrated on the following page.

Analysis of the Medicaid QC data is more complicated than the processes for other QC systems for the following reasons:

- The MQC system uses a stratified sampling design that requires weighting of the data.

EXHIBIT 5100-1

DATA ANALYSIS AND PROGRAM OPERATIONS



- There is a time lag between the review month and the time when the benefit amount for the review month can be determined. In other QC systems, the benefit amount is part of the eligibility determination and is paid during the review month.

- Finally, MQC data analysis is more complicated because of the Medicaid program's potential for error. In addition to agency and client errors, there may be such errors as duplicate or otherwise inappropriate billing for services, spend-down-requirement errors and third-party liability errors.

5120 Purpose of the Data Analysis Guide

This Section of the Medicaid Quality Control (MQC) Manual explains a variety of techniques that can be used to analyze MQC data. It suggests some types of information that can help improve management of the Medicaid program, especially in planning corrective actions and evaluating their impacts.

Such corrective actions based on the results from the MQC system can include simplification of policy, revision of staffing ratios or patterns, changes in methods and contents of training for eligibility determination and its supervision, development of error prone profiles (for intensive or more frequent redetermination of cases), etc. Some types of information needed to determine which combination of the above are appropriate include:

- Case and payment error rates, by aid category and program-wide

- Projected amounts paid in error, by aid category and program-wide

- The level of confidence in the above estimates

- Determination if the error rates between strata are significantly different

- Trends in error rates
- Types of errors, i.e., proportion due to agency, client, etc.
- Estimates of ineligibility payment error rates using extended data base
- Clusters of errors to develop error-prone case profiles, i.e., cases that warrant more intensive and/or more frequent redeterminations

This Data Analysis Guide is intended to assist data analysts and statisticians in using the Federal Tables of Section 4000 for various analyses, calculating error rates, as well as suggesting a variety of other uses (and the associated analytical techniques) for the MQC data. These include:

- Constructing error-prone case profiles
- Conducting tests of differences in case error rates between various populations
- Analyzing agency and beneficiary factors that affect the error rate
- Conducting tests of association between error rate and type of most recent action or presence of earned income
- Conducting tests of association between various types of error, e.g., eligibility/liability and third-party errors, etc.

Tests presented in this Manual are for the purpose of identifying the presence or absence of significant differences among specific variables.[1]

Any conclusions reached as the result of the application of these tests should be subject to further study for corrective action.

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[1] All analysis techniques presented in the manual assume simple random or systematic samples, and are to be applied to an individual stratum, unless otherwise specified. If a stratum has been substratified, analyses must be performed on each individual substratum. Data from sample designs other than simple random or systematic require weighting before the analysis can begin.

5130 State Medicaid Quality Control Data

The major data source for conducting the analyses described in this Guide is the State Medicaid Quality Control Review Schedule. Data are summarized and reported in eleven Tables by States to the Regional Office every six months (within eight months of the close of the reporting period except for Table X which is due earlier). [1]

These tables are presented in Section 4000 of the Medicaid Quality Control Manual, Reports. Most of these tables report data on each of the primary strata.

For this Section of the Data Analysis Guide, the contents of these tables are explained. Some of the tables described here are in two parts. The contents of each part will be described separately.

Table IA: Statistical Summary. For each stratum, this table displays universe and sample workload statistics for the reporting period. Overall, it contains the number of cases sampled and their status, and universe data on the Medicaid caseload and dollar payments.

Table IB: Number of Cases and Amount of Error by Error Classification. For eligibility, liability, claims processing and third party liability errors, this table presents sample values and error rates for the number of error cases and for the gross and unduplicated dollar amount of errors. Specific information which can be derived from this table includes the percentage of error cases with claims by stratum, and gross and unduplicated payment errors as a percentage of total payments to sample cases.

Table IIA: Dollar Value of Eligibility/Liability Errors by Source of Error. For each stratum, this table displays the dollar amount of errors for ineligible cases (or case members) and cases with understated liability. It presents the dollar amount of liability understated and eligibility errors separately and in total by type of error. Table IIA shows these values as a percentage of dollar amount of agency and beneficiary errors.

Table IIB: Dollar Value of TPL and CP Errors by Source of Error. For each stratum, this table presents

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[1] Note that Section 4000 of the Medicaid Quality Control Manual, Reports gives each State the option of submitting edited, machine-readable Review Schedule data in lieu of Reports I through IXB.

the gross dollar amount of third party liability error by source of error and claims processing errors by element of error.

Table III: Number of Cases by Type of Error Combination. Table III summarizes the distribution of all cases reviewed by seventeen combinations of eligibility, liability, third party liability and claims processing errors for each stratum. The data in this table are useful for determining the association of error proneness among any combination of these types of errors.

Table IVA: Number of Cases with Eligibility/Liability Errors by Element of Error. This table presents the number of sample cases distributed by element of liability or eligibility errors and by stratum. In addition, the table contains the percent distribution of these errors.

Table IVB: Dollar Amount of Eligibility/Liability Errors by Element of Error. This table is structured similarly to Table IVA. It displays the dollar amount of eligibility and liability errors by stratum. The dollar amounts of errors are distributed by the various elements of error. The table also presents the percent distribution of the dollar amount of errors.

Table V: Number of Sample Cases by Third Party Liability Status. This table displays sample statistics on all sample cases by stratum, showing the distribution according to third party liability status. The percent distribution is also presented.

Table VI: Dollar Amount of Third Party Liability Error by Type of Service. Table VI presents, by stratum, sample statistics on the dollar amount of third party liability errors by the different categories of service (institutional and non-institutional). The percent distribution is also given.

Table VII: Dollar Amount in Error by Type of Third Party Liability. This table contains sample statistics by stratum on the dollar amount of third party liability errors by category of third party liable for payment.

Table VIII: Claims Processing Error Code Frequency Analysis. In this table, the percent distribution of claims processing errors by element error codes and nature codes is exhibited. The statistics in this table are overall percentages for all strata.

Table IXA: Case Characteristics for Both Cases With and Without Eligibility/Liability Errors (MAO Stratum Only). Table IXA presents statistics on the number of MAO cases with errors and the number of MAO cases without errors for characteristics such as the number of persons in the medical assistance group, type of income present, etc.

Table IXB: Case Characteristics - Eligibility/Liability Error Cases Only (MAO Stratum Only). This table displays statistics on cases with errors by age of the error and by the relationship of the date of the most recent error to the date of the most recent action. The data in this table are for the Medical Assistance Only (in 1634 States) or the Medical Assistance and Other (in non-1634 States) stratum only.

Table X: Universe Data by Stratum or Substratum. This table displays universe data for each stratum (or substratum) on the number of Medicaid cases and dollars paid for Medicaid cases for each month of the review period. This data is used primarily for calculating the stratum/substratum weights.

Table XI: Correction Factor Data - Sample Payments. Table XI contains statistics on payments made for sample cases during and after the completion of the normal claims collection period. It is the instrument used for estimating the effect of claims received after the conclusion of the normal claims collection period.

5200 CASE ERROR RATES

Case error rates are estimates of the percentage of cases with an error. For corrective action planning, it is necessary to determine the rates for various parts of the total population and to isolate the rates for specific types of errors.

This Section covers the computation of case error rates and the variance of case error rates used in obtaining confidence intervals from a stratified sample and for testing significant differences between case error rates. A method is described for testing for a significant relationship between case characteristics and case error rates.

Although case error rates are less informative in some respects than payment error rates, the former rates can be used quite extensively because they are easier to compute and available earlier than the payment error rates for the review period.

5210 Case Error Rate Estimates

The program-wide case error rate is simply the error rate obtained by weighting the individual stratum case error rates by the percentage of the population of Medicaid cases included in each stratum, i.e., MAO, AFDC, and SSI. To be more precise, let:

n_i = number of cases for which reviews were completed for the ith stratum (i = 1, 2, 3)*, (Item IV of Table IA);

y_i = number of cases with errors (see Item IA, Table IB);

N_i = average monthly number of the universe of cases represented by the ith stratum or aid category (i = 1, 2, 3)*, (Table X);

*Throughout this Manual, i = 1, 2, 3 for 1634 States, and i = 1, 2 for Non-1634 States.

$$w_i = \frac{N_i}{\sum_{i=1}^{3} N_i}$$, which is the portion of universe cases represented by stratum i.

Then $\hat{p}_i = y_i/n_i$ equals the estimate of the stratum case error rate for stratum i (i = 1, 2, 3). These are the numbers in Table IB, Item IA, columns 1, 2, and 3. Then the estimate of the program-wide case error rate, depicted in column B of Table IB, Item IA, is computed as:

$$\hat{p} = \sum_{i=1}^{3} w_i(y_i/n_i)$$

Illustration:

Suppose the cases in the Medicaid population for the past six months have been distributed as 70% to MAO, 20% to AFDC and 10% to SSI, i.e., $N_1/(N_1 + N_2 + N_3) = .7$, $N_2/(N_1 + N_2 + N_3) = .2$, and $N_3/(N_1 + N_2 + N_3) = .10$. Further, suppose the number of cases reviewed in each stratum is 200, 300, and 100, respectively and the numbers of cases in error for each of the strata were 10, 24, and 7. Then the estimate of the overall case error rate would be:

$$\hat{p} = .7(10/200) + .2(24/300) + .1(7/100) = .058 = 5.8\%$$

5220 Case Error Rate Confidence Intervals

The confidence interval for the case error rate (p) is:

$$\hat{p} \pm C \times \text{Standard error of } \hat{p}$$

where C = 1.96 for the 95% confidence interval

= 1.64 for the 90% confidence interval

= 1.28 for the 80% confidence interval

and where the standard error of $\hat{p}$, equal to the standard deviation of the process[1] divided by the square root of the number of observations, relates how good an estimate of the true error rate is provided by the sample error rate. (Note that $\hat{p}$ is the notation used for the estimate of the unknown error rate p.)

Within the ith stratum, the standard error of the sample proportion $\hat{p}_i$, is given by

$$\text{standard error of } \hat{p}_i = \sqrt{\frac{\hat{p}_i \ (1 - \hat{p}_i)}{n_i}}$$

where n_i is the number of completed reviews for stratum i.

Therefore, the 95% confidence interval for a given stratum case error rate would be:

$$\hat{p}_i \pm 1.96 \sqrt{\frac{\hat{p}_i \ (1 - \hat{p}_i)}{n_i}}$$

The standard error of the program-wide case error rate estimate, $\hat{p}$, for all strata combined is

$$\text{standard error } \hat{p} = \sqrt{\sum_{i=1}^{3} \frac{w_i 2 \ (\hat{p}_i) \quad (1 - \hat{p}_i)}{n_i}}$$

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[1] The underlying process, called a Bernoulli process, is a random variable with only two possible outcomes; namely: The case is in error (in which instance the random variable is 1) and the case is not in error (in which instance the random variable takes on the value 0). The standard deviation of the process measures the dispersion in the process or lack of homegeneity.

where w_i is the proportion of all Medicaid cases which are in stratum i.

The 95% confidence interval for the program-wide case error rate then, is given by

$$\hat{p} \pm 1.96 \sqrt{\sum_{i=1}^{3} \frac{w_i 2 \, (\hat{p}_i)\,(1 - \hat{p}\,)}{n_i}}$$

Numerical Illustration

Suppose that $w_1 = .70$, $w_2 = .20$, $w_3 = .10$, i.e., 70% of the cases were MAO cases, 20% of the cases were AFDC, and 10% of the cases were SSI. Further, suppose that $\hat{p}_1 = .05$, $\hat{p}_2 = .08$, $\hat{p}_3 = .07$, and $n_1 = 200$, $n_2 = 300$, $n_3 = 100$. Then, for the 600 cases, one can state:

- The estimate of the program-wide case error rate is:

  $.7(.05) + .2(.08) + .1(.07) = .058 = 5.8\%$

- The 95% confidence interval for the program-wide case error rate is:

  $.058 \pm 1.96 \left[(.7)^2(.05)\,(.95)/200 + (.2)^2(.08)\,(.92)/300 + (.1)^2(.07)\,(.93)/100 \right]^{\frac{1}{2}} =$
  $.058 \pm 1.96\ (.012)$, or from .034 to .082

5300 SUGGESTED ANALYSES USING CASE ERROR RATES AND ILLUSTRATIONS OF USE OF FEDERAL REPORTS

For many issues facing Medicaid managers, it is important to compare two populations with regard to some quantitative characteristic, e. g., the case error rate, number of errors per case, fraction of cases with claims, etc. The question can take various forms: Are the case error rates different? Is the first case error rate greater than the second? Is the first case error rate less than the second? In this Section, we illustrate the basic method for answering these types of questions.

5310 A Statistical Test for Significant Differences Between Two Case Error Rates

One technique directed toward answering the above questions is a test to determine if one reporting period or stratum case error rate is larger than another. Specifically, the test can be focused on discerning if the case error rate for a given stratum has declined significantly as a result of corrective actions; or, on discerning if the case error rate for the AFDC stratum is significantly different from that of the SSI stratum. Essentially, the test consists of evaluating the hypothesis that there has been no reduction in the stratum case error rate in the first situation, and that there is no difference in the stratum error rates for the second situation. In addition, some prescribed low likelihood of arriving at the wrong decision based on the results of the sample is required. This is referred to as the level of significance of the test.

5311 A Numerical Illustration for Analyzing the Impact of Corrective Actions

Suppose $\hat{p}_1$ is the estimated stratum case error rate for the first MQC period based on a

sample of n_1 cases, and $\hat{p}_2$ is the similar rate for the subsequent period with n_2 cases. The major concern here is whether or not a significant improvement has taken place from one period to the next. Two hypotheses should be considered: the "null hypothesis" H_0: $p_1 \leq p_2$, (i.e., no improvement has taken place) and the alternative hypothesis H_A: $p_1 > p_2$.

Two analytical strategies can be used to determine the impact of corrective action: a one-sided hypothesis test, and a two-sided hypothesis test. In the first test, the null hypothesis will only be rejected if $\hat{p}_1$ is sufficiently larger than $\hat{p}_2$. The rejection region, therefore, will take this form: Reject H_0 only if $\hat{p}_1 - \hat{p}_2 >$ some value (which is relative to the level of significance[1] desired). The second (two-sided or two-tail) test involves a hypothesis testing only if p_1 is different from p_2. Thus, a one-tailed test measures if one error rate is larger than another, while a two-tailed test measures if one rate is larger or smaller than the other, hence the term two-tailed. The example in Section 5312 utilizes a two-sided test. It can be

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[1] The level of significance is the likelihood that the null hypothesis will be rejected, based merely on the evidence of sample data, if the null hypothesis were indeed true. The null hypothesis is taken to be of the form $p_1 \leq p_2$ so that rejection of the hypothesis would support the conjecture that an improvement had indeed taken place. Because, by its nature, a sample is only a part of an entire population, if sample data cannot reject a null hypothesis and conclude a difference has occurred, the statistician never concludes that differences in the populations do not exist. Rather, he says that the sample was not sufficiently large to exhibit a difference. The distinction here is subtle, but important. Samples which exhibit no difference are regarded as providing insufficient evidence, rather than concluding a real difference is not there.

shown that if the sample sizes are reasonably large[1], the rejection criterion at the level of significance of 5% for a one-sided test is: Reject H_0 only if:

$$\left|\hat{p}_1 - \hat{p}_2\right| > 1.64 \sqrt{\pi(1-\pi)\ (1/n_1 + 1/n_2)} \qquad (1)$$

where $\pi = (n_1\hat{p}_1 + n_2\hat{p}_2)/(n_1 + n_2)$.

(See Table I in Section 5312 for an illustration of how the constant (1.64 for the 5% level of significance) varies for other levels of significance.)

For instance, suppose $\hat{p}_1 = 21\%$, $\hat{p}_2 = 15\%$, $n_1 = 300$, $n_2 = 300$. Then the right hand side of the inequality on (1) is .05. Since $\left|\hat{p}_1 - \hat{p}_2\right| = .06$, we can reject the null hypothesis and conclude with less than a 5% chance of being wrong that a reduction in the stratum case error rate has indeed occurred, i.e., that $\hat{p}_1 > \hat{p}_2$.

5312 A Numerical Illustration to Determine if Various Stratum Case Error Rates Differ Significantly: Use of Federal MQC Reports, Table IA and IB.

Suppose we now wished to determine if there was a significant difference (lower or greater) in the case error rates between two strata, the MAO stratum and AFDC stratum. Two Federal Medicaid Quality Control Reports should be examined: Table IA, "Statistical Summary," and Table IB, "Number of Cases and Amount of Error by Error Classification."

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[1] This test is appropriate if the sample sizes n_1 and n_2 are reasonably large, i.e., over 30. A Chi-Square test can be used for smaller sample sizes. A reference for more detail is Statistical Analysis for Business Decision, Spurr and Bonini, 1973.

Those reports have been partially completed and are shown for illustrative purposes on the following two pages. Our example of Table IA, data element IV, shows that $n_1 = 250$ and $n_2 = 200$. From our example of Table IB, data element IA, we can compute $\hat{p}_1 = 30/250 = 12\%$, $\hat{p}_2 = 20/200 = 10\%$.

To determine if the difference is significant, which may indicate that more effort should be directed toward one stratum versus another, we can again compare $\hat{p}_1 - \hat{p}_2 = .12 - .10 = .02$ with the previous right side of the inequality in (1) involving n_1, n_2, $\hat{p}_1$, and $\hat{p}_2$. Computing this, we can obtain the following:

$$\Pi = (n_1\hat{p}_1 + n_2\hat{p}_2)/(n_1 + n_2) = \left[(250)(.12) + (200)(.10)\right]/450 = .111$$

And then,

$$Q = \sqrt{\Pi\ (1-\Pi)\ (1/n_1 + 1/n_2)} = \sqrt{(.111)\ (.889)(1/250 + 1/200)} = .030$$

We can reject the hypothesis that $\hat{p}_1 = \hat{p}_2$ at the 5% level of significance if either $\hat{p}_1 - \hat{p}_2 > 1.96Q = 1.96\ (.030) = .059$, or alternatively if $\hat{p}_1 - \hat{p}_2 < -1.96Q = -1.96(.030) = -.059$, i.e., if the random observations indicate that either p_1 is much smaller or much larger than p_2. Since $\hat{p}_1 - \hat{p}_2 = .02$, we cannot say that there is a significant difference in the stratum case error rates. One of the conclusions which may be drawn from this test is that concentrating more resources on one stratum versus the other would not be justified. The constant 1.96, used in the above two-sided test for the level

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Table IA
MEDICAID QUALITY CONTROL: Statistical Summary

State _____ Reporting Period _____ to _____

	Stratum			TOTAL
	MAO A	AFDC A	SSI A	B
I. AVERAGE MONTHLY MEDICAID CASELOAD				
II. AVERAGE MONTHLY UNIVERSE OF MEDICAID PAYMENTS MADE DURING THE REPORTING PERIOD	$10,000 000	$15,000 000	$5,000, 000	
III. NUMBER OF CASES SELECTED FOR THE REPORTING PERIOD				
IV. NUMBER OF REVIEWS COMPLETED DURING THE REPORTING PERIOD	250	200	150	
V. TOTAL NUMBER OF SAMPLE CASES FOR WHICH REVIEWS HAVE NOT BEEN COMPLETED				
A. Listed in error				
B. Moved out of state since review month				
C. Unwilling to give information				
D. Could not be located				
E. Other reasons				
VI. NUMBER OF COMPLETED REVIEWS HAVING CLAIMS				
VII. NUMBER OF CLAIMS PROCESSED FOR SAMPLE CASES				
VIII. DOLLAR PAYMENTS FOR ALL SAMPLE CASES REVIEWED	$12,000	$16,000	$5,000	

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Table IB

MEDICAID QUALITY CONTROL: Number of Cases and Amount of Error by Error Classification

State _____ Reporting Period _____ to _____

		Stratum			Total Percent Only B
		MAO A	AFDC A	SSI A	
I. NUMBER OF CASES BY ERROR CLASSIFICATION AND AS A PERCENT OF CASES COMPLETED					
A. Cases having one or more errors	(1) #	30	20	10	
	(2) %				
B. Ineligible cases	(1) #				
	(2) %				
C. Eligible with ineligible members	(1) #				
	(2) %				
D. Liability understated error only	(1) #				
	(2) %				
E. Liability overstated error only	(1) #				
	(2) %				
F. Liability understated error with ineligible members	(1) #				
	(2) %				
G. Liability overstated error with ineligible members	(1) #				
	(2) %				
H. Claims processing errors	(1) #				
	(2) %				
I. Third party liability errors	(1) #				
	(2) %				
II. NUMBER OF CASES WITH CLAIMS BY ERROR CLASSIFICATION AND AS A PERCENT OF CASES WITH CLAIMS					
A. Cases having one or more errors	(1) #				
	(2) %				
B. Ineligible cases	(1) #				
	(2) %				
C. Eligible with ineligible members	(1) #				
	(2) %				
D. Liability understated error only	(1) #				
	(2) %				
E. Liability overstated error only	(1) #				
	(2) %				
F. Liability understated error with ineligible members	(1) #				
	(2) %				
G. Liability overstated error with ineligible members	(1) #				
	(2) %				
H. Claims processing errors	(1) #				
	(2) %				
I. Third party liability errors	(1) #				
	(2) %				

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of significance of 5%, varies as the desired level of significance changes. The other constants are shown in Table 2.

TABLE 1

MULTIPLIERS FOR ONE-SIDED HYPOTHESIS TEST AS A FUNCTION OF LEVEL OF SIGNIFICANCE DESIRED

Level of Significance	Value of Multipliers
1%	2.32
5%	1.64
10%	1.28

TABLE 2

MULTIPLIERS FOR TWO-SIDED HYPOTHESIS TEST AS A FUNCTION OF LEVEL OF SIGNIFICANCE DESIRED

Level of Significance	Value of Multipliers
1%	2.57
5%	1.96
10%	1.64

5320 Contingency Tables and Case Error Rates

One of the important statistical tools to be considered in analyzing the MQC data is the use of contingency tables[1] and the statistical test for any association or relationship between certain case characteristics such as aid category, county, use of deprivation code, presence of earned income, most recent agency action, etc., and error proneness. The uncovering of these types of associations has been found to be a cost effective approach for initiating corrective actions and is discussed in more detail in a subsequent Section dealing with the construction of error prone profiles.

In this Section we present several numerical illustrations using the MQC Federal Reports and contingency tables to test for a significant association between certain case characteristics and the likelihood of the case possessing eligibility or liability errors. It is important in computing these calculations to carry at least four decimal places since the impact of rounding errors can be considerable.

5321 Test for Determining if the "Most Recent Agency Action" is Related to Error Proneness: Use of Federal MQC Report, Table IXA

Consider the question of ineligibility or liability errors as they relate to whether the most recent agency action was an approved application or a redetermination. This is an important issue since its answer can help determine an efficient allocation of resources.

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[1] A Contingency Table is a convenient way to summarize the impact of various factors on the outcomes of an experiment. It consists of a table or matrix of "Cells" which depict the number of observations belonging to the intersection of the corresponding row and column factors.

The analysis of this problem is illustrated with the use of Federal MQC Report, Table IXA, partially completed and shown on the following page.

From summary data Item IIA, Columns A and C, we can observe that for 245 of the 600 cases reviewed, the most recent action was an approved application. Item II B, Columns A and C, show that 355 cases were recently redetermined.

The eligibility/liability error rate for the grouping of cases where the most recent action is "an approved application" is shown as 45/245 = 18.4%, based on the 245 cases. Similarly, the eligibility/liability error rate for cases where the most recent action is a redetermination is 50/355 = 14.1%, based on 355 cases. To determine if there is a significant relationship between the most recent agency action and error proneness, construct the following table for use in a Contingency Table/Chi-Square test.

Most Recent Action	Cases in Error $j = 1$	Cases not in Error $j = 2$	ROW TOTAL
$i = 1$: Application	45	200	245
$i = 2$: Redetermination	50	305	355
COLUMN TOTAL	95	505	600

The Chi-Square Test is based on the difference between the frequencies (not proportions) observed, and the frequencies one would expect under a null hypothesis that most recent action and error proneness are unrelated. If the observed cell frequencies designated $O_{i,j}$ do not differ much from the expected frequencies denoted $E_{i,j}$, the value of the test statistic is small. As the observed frequencies begin to differ from the expected frequencies, the value of the test statistic will increase, thereby lending more weight to the conclusion that the null hypothesis should be rejected. The decision rule for rejection has a one tail

Table IXA

MEDICAID QUALITY CONTROL: Case Characteristics for Both Cases With and Cases Without Eligibility/Liability Errors (MAO Stratum Only)

State _____ Reporting Period _____ to _____

CHARACTERISTIC	Cases with Error		Cases Without Error	
	Number A	Percent B	Number C	Percent D
I. TOTAL	95	100%	505	100%
II. TYPE OF MOST RECENT ACTION		100%		100%
A. Approved application	45		200	
B. Redetermination	50		305	
III. NUMBER OF MONTHS SINCE MOST RECENT ACTION		100%		100%
A. Three or fewer				
B. Four to six				
C. Seven to nine				
D. Ten to twelve				
E. Thirteen or more				
IV. NUMBER OF PERSONS IN HOUSEHOLD		100%		100%
A. One				
B. Two				
C. Three				
D. Four				
E. Five				
F. Six				
G. Seven				
H. Eight				
I. Nine				
J. Ten or more				

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rejection region, using the Chi-Square distribution with a number of degrees of freedom equal to the number of rows less 1, multiplied by the number of columns, less 1. Finally, this test should only be made when each category or class has a certain minimum expected frequency. A good working rule is that for at least 80% of the cells, the expected frequency should exceed 5, and that expected frequencies of zero are not permitted. If these conditions do not hold, then one solution is to group or aggregate classes until the above minimum criterion for appropriateness is satisfied.

The key test statistic, or criterion, for acceptance or rejection of the hypothesis that the row and column factors are independent is given by:

$$x^2 = \sum_{j=1}^{2} \sum_{i=1}^{2} (O_{i,j} - E_{i,j})^2 / E_{i,j}$$

where $O_{i',j}$ is the observed frequency in the i,j cell, and $E_{i,j}$ is the expected frequency in the i,j, cell supporting the null hypothesis, i.e., there is no association between the type of most recent action and error proneness. The $E_{i,j}$'s are obtained from:

$$E_{i,j} = \frac{\text{row total i x column total j}}{\text{Grand total of all frequencies}}$$

This, then, is the average number of observations one would expect to see in the $_{i,j}$th cell if the row and column factors were independent. For instance, reading off directly from the table presented on page 20:

$$O_{1,1} = 45,\ O_{1,2} = 200$$

$$O_{2,1} = 50,\ O_{2,2} = 305$$

To compute the expected frequency $E_{i,j}$ under the assumption of no association, let us consider $E_{1,1}$. It is the product of the Row 1 total, i.e., 245, and the Column A total, i.e., 95, divided by the total number of observations, 600. Thus, $E_{1,1} = 245 \times 95/600 = 38.7917$.

Similarly, $E_{1,2} = (245 \times 505)/600 = 206.2083$

$E_{2,1} = (355 \times 95)/600 = 56.2083$

$E_{2,2} = (355 \times 505)/600 = 298.7917$

Therefore, $\sum_{j=1}^{2} \sum_{i=1}^{2} \frac{(O_{i,j} - E_{i,j})^2}{E_{i,j}} = (45-38.7917)^2$

$/38.7917 + (200 - 206.2083)^2/206.2083 +$

$(50-56.2083)^2/56.2083 + (305 - 298.7917)^2/$

$298.7917 = 1.995$

The formula for the degrees of freedom in the Chi-Square Test is equal to the number of rows less 1, multiplied by the number of columns less 1. Therefore, one obtains (2-1)x(2-1) = 1 degree of freedon. If we look at the Chi-Square Table in the Appendix, we can see the critical value of 3.84 for a 5% level of significance. Therefore, since 1.995 < 3.84, we cannot reject the hypothesis that two factors, "most recent action" and "error proneness," are unrelated (if we want less than a 5% chance of being wrong). This is in spite of the observation that the sample error rate associated with application is 18.4%, which compares with the 14.1% associated with redeterminations.

5322 Presence of Earned Income as Related to Error Proneness: Use of Federal MQC Report Table IXA

Another illustration using Table IXA is in determining if the presence of earned income is

highly associated with the likelihood of an eligibility/liability error.

Data Elements VI A, Columns A and C (35 and 125 respectively), partially completed and presented on the next page, show that 160 of the cases had earned income as one of the types of income present. The likelihood that a case has an eligibility or liability error, given earned income, is 35/160 or .219. From Item I of Table IXA, on page 21, observe that the likelihood of a random case having an error is 95/600 or .158. Earned income, therefore, appears to be better than random search as a screen for detecting error cases.

To see if it is statistically significant, first separate those cases with earned income from those without. From Item VI A of Table IXA, 160 of the cases have earned income and 440 do not. Of those with earned income, 35 are in error. Of the 440 without earned income, the number with eligibility/liability error is 95 - 35 = 60. Once again, apply the Chi-Square Test used in the previous example to determine if the presence or absence of earned income is associated with error proneness. If it is, then the cases with earned income indicated in the case record might well merit more frequent and/or more intensive reviews.

Presence of Earned Income	Cases with Eligibility/ Liability Error	Cases Without Eligibility/ Liability Error	TOTAL
Yes	35	125	160
No	60	380	440
TOTAL	95	505	600

Then, we compute as before:

$$\chi^2 = \sum_{i=1}^{2} \sum_{j=1}^{2} (O_{i,j} - E_{i,j})^2 / E_{i,j}$$

Table IXA

MEDICAID QUALITY CONTROL: Case Characteristics for Both Cases With and Cases Without Eligibility/Liability Errors (MAO Stratum Only)

State _____ Reporting Period _____ to _____

CHARACTERISTIC	Cases With Errors		Cases Without Errors	
	Number A	Percent B	Number C	Percent D
V. NUMBER OF PERSONS IN MEDICAID ASSISTANCE GROUP		100%		100%
A. One				
B. Two				
C. Three				
D. Four				
E. Five				
F. Six				
G. Seven				
H. Eight				
I. Nine				
J. Ten or more				
VI. TYPES OF INCOME PRESENT				
A. Earned income	35		125	
B. RSDI benefits	0		60	
C. Other government benefit programs	5		60	
D. Pensions and other benefits	10		30	
E. Other unearned income	10		25	

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In which case:

$O_{1,1} = 35,\ O_{1,2} = 125,\ O_{2,1} = 60,\ O_{2,2} = 380$

$E_{1,1} = (160 \times 95)/600 = 25.3333$

$E_{1,2} = (160 \times 505)/600 = 134.6667$

$E_{2,1} = (440 \times 95)/600 = 69.6667$

$E_{2,2} = (440 \times 505)/600 = 370.3333$

Then:

$$\chi^2 = (35-25.3333)^2/25.3333 + (125-134.6667)^2/134.6667 + (60-69.6667)^2/69.6667 + (380-370.3333)^2 /370.3333 = 5.98$$

If we look at the Chi-Square Table (see Appendix A) for 1 degree of freedom, we find a critical value of 3.84 at a 5% level of significance. From that we can state at a level of confidence of 95% (since 5.98 > 3.84) that the presence or absence of earned income is significantly related to error proneness in the population and as such may be a predictor of of eligibility/liability errors.

5323 Is Geographical Location Related to Error Proneness? Analysis of a Four by Two Contingency Table

For some types of corrective actions, it is useful to know if case errors are concentrated in certain regions or counties. If so, corrective

actions may be implemented on a selective geographical basis rather than for the entire caseload, e.g., additional verification and supervisory review of completed case actions.

In all inferences from a sample, some caution must be used in projecting sample findings to the total caseload. The following example is one in which it appears, from a tabulation of errors by region, that errors are concentrated in one region. To determine if the observed variation among regions is large enough to support the inference that the population of errors actually are concentrated in certain regions, it is necessary to do a test of statistical significance of the independence of regions and the error rate. The Chi-Square test as applied to contingency tables can be used for this purpose. Suppose there are four regions in a state and the regional error distribution based on 170 completed reviews is as follows:

Region	Cases in Error $j = 1$	Cases Not in Error $j = 2$	TOTAL
$i = 1$	10	30	40
$i = 2$	9	31	40
$i = 3$	9	41	50
$i = 4$	13	27	40
TOTAL	41	129	170

Calculate the Chi-Square statistic :

$$\chi^2 = \sum_{i=1}^{4} \sum_{j=1}^{2} (O_{i,j} - E_{i,j})^2 / E_{i,j}$$

Upon making the substitution depicted twice before, where $O_{1,1} = 10, O_{2,1} = 9$, $O_{3,1} = 9$, $O_{4,1} = 13$, $O_{1,2} = 30$, $O_{2,2} = 31$, $O_{3,2} = 41$, $O_{4,2} = 27$, and $E_{1,1} = (41 \times 40)/170 = 9.6471$;

$E_{1,2}$ = (40 x 129)/170 = 30.3529
$E_{2,1}$ = (40 x 41)/170 = 9.6471
$E_{2,2}$ = (40 x 129)/170 = 30.3529
$E_{3,1}$ = (50 x 41)/170 = 12.0588
$E_{3,2}$ = (50 x 129)/170 = 37.9412
$E_{4,1}$ = (40 x 41)/170 = 9.6471
$E_{4,2}$ = (40 x 129)/170 = 30.3529

The resulting computed value of $\chi 2 = 2.63$. The proper degrees of freedom is (4-1) x(2-1) = 3. At the 5% level of significiance, the critical threshold is 7.81. Consequently, since 2.63 < 7.81, the hypothesis that the region and error rate are unrelated cannot be rejected.

5324 Is Liability Error Proneness Related to Third Party Error Proneness? Illustration of the Use of Table III

Consider the numerical values included in Table III of Section 4000, entitled "Number of Cases by Type of Error Combination," focusing on the MAO column, Rows A-Q. (See illustration on next page.) Observe that this Table shows 300 cases having been reviewed: 223 cases with no errors, 30 cases with eligibility errors only, etc.

Suppose we wished to determine if there is any association between liability error proneness and third party error proneness. If there were, then we might want to consider a special liability review for cases where TPL problems were uncovered. To answer this question, we must construct a Contingency Table from Table III. To do this, simply count the number of cases having a third party error, either alone or in combination with others. This is 19. Repeat the count for liability errors; this is 21. The 264 represents

Table III
MEDICAID QUALITY CONTROL: Number of Cases by Type of Error Combination

State _____ Reporting Period _____ to _____

ERROR COMBINATIONS	Stratum						Total Percent Only
	MAO		AFDC		SSI		
	Number A	Percent B	Number A	Percent B	Number A	Percent B	C
A. Total number of completed case reviews	300	100%		100%		100%	100%
B. No errors	223						
C. Eligibility* errors only	30						
D. Liability errors only	10						
E. TPL errors only	5						
F. CP errors only	10						
G. Eligibility* and liability errors only	5						
H. Eligibility* and CP errors only	1						
I. Eligibility* and TPL errors only	8						
J. Liability and CP errors only	1						
K. Liability and TPL errors only	1						
L. CP and TPL errors only	1						
M. Eligibility,* liability, and CP errors only	1						
N. Eligibility*, liability, and TPL errors only	1						
O. Liability, CP, and TPL errors only	1						
P. Cases with eligibility*, CP, and TPL errors only	1						
Q. Eligibility*, liability, CP, and TPL errors	1						

* For this table, eligibility errors include ineligible cases and also eligible cases with ineligible members.

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all the cases with neither a TPL error nor a liability error and there are 4 cases having both.[1] The resulting Contingency Table is:

	No TPL Error Present	TPL Error Present	TOTAL
No liability error present	264	15	279
Liability error present	17	4	21
TOTAL	281	19	300

The computed value of the Chi-Square Test statistic is 6.1532.

It follows, then, for a 5% level of significance with 1 degree of freedom, i.e., (2 rows - 1) x (2 columns - 1), a critical threshhold of 3.84 results. Therefore, since 6.15 exceeds 3.84, we can state that an association does exist.

[1] In addition there were seventeen cases in which there was a liability error present but not a third party error; similarly there were fifteen cases in which there were third party errors present but no liability errors.

5400 PAYMENT ERROR RATES

5410 Description of Basic Data Set and Extended Data Set

This chapter is concerned with the method of computing the payment error rate for each stratum as well as for the overall payment error rate, using the basic data, i.e., six service months and four subsequent months of payment data for each of the six service months.[1]

The extended data set (see Table XI, Section 4000) differs from the basic data set in that there are additional payment months considered, i.e., ten payment months (including the service month itself) for the first service month, nine payment months for the second service month, eight for the third, seven for the fourth, six payment months for the fifth service month and five payment months (the same as in the case of the basic data set) for the sixth service month. The additional data simply takes into account the additional value of the claims paid for the given service months, utilizing the more complete distribution of lag between month of service and payment; this can be helpful in refining the estimate of the dollar impact of ineligibility errors.

5420 Discussion of Data Elements to be Used for the Payment Error Rates

The key data source for this calculation is the MQC Statistical Summary, Tables IA and IB, in Section 4000 of the MQC Manual. These reports contain, by aid category or stratum, the following data elements needed for the computation of the error rates:

1. The total payments for cases in the completed sample (Item VIII, Table IA).

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[1] In some cases, claims may occur before service months, i.e., Medicare buy-ins and HMO premiums.

2. The total unduplicated dollar amounts of errors (Item IVA, Table IB).

The only other data elements needed are the program-wide breakdowns of the numbers of cases by aid categories, and the fraction of total program dollar volume for each of the three strata.[1]

5430 Formulae and Numerical Illustrations for the Estimate of the Program-Wide Payment Error Rate

Before defining the calculation in mathematical terms, it may be helpful to express the terms verbally. The stratum unduplicated payment error rate is the estimate of the fraction of the stratum program dollars paid in error. For this calculation, the unduplicated dollar amount in error is utilized. That is, even if a claim is paid in error for several reasons, the dollar value of the error is counted only once. The overall payment error rate is obtained simply by weighting the individual stratum mean payment error rates by the percentage of program dollars represented by that aid category or stratum. (See Section 4300, MQC Manual, Reports.) To be more precise, consider the following notation, referred to here and in other sections of the MQC Manual:

y_i = Total unduplicated dollars paid in error in the sample for the MAO, AFDC and SSI stratum respectively for the six-month service period and four months of payment data (i = 1, 2, 3 and refers to the MAO stratum, AFDC stratum, and SSI stratum respectively). This number is obtained from Table IB, Item IVA. (Note that any dollar variable can be used here.)

z_i = Total dollars paid for the sample in the ith stratum for the six-month period (i = 1, 2, 3), Table IA, Item VIII.

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[1] If a State substratifies its sample, then the error rate computation should be carried out at that level.

D_i = Average total monthly Medicaid payments to the ith stratum for the six-month period (i = 1, 2, 3), Table X.

The estimate of the program-wide unduplicated payment error rate, then, shown in the 4th column of Table IB, Item IVA, is:

R = program-wide unduplicated payment error rate

$$= \sum_{i=1}^{3} (y_i/z_i) \cdot D_i / \sum_{i=1}^{3} D_i$$

As an illustration, suppose the Medicaid Program dollars for the past six-month period had been distributed as follows: $500,000 to the MAO stratum, $300,000 to the AFDC stratum and $200,000 to the SSI stratum. Further, suppose the dollar payments in error for the three groups are, respectively, $2,000, $4,000 and $6,000 (note that these are the y_i's). Also, suppose the dollars represented by the sample are $20,000, $24,000, and $30,000, respectively (these are the z_i's). Then the overall unduplicated payment error rate is given by:

$$\frac{\frac{2,000}{20,000} \times 500,000 + \frac{4,000}{24,000} \times 300,000 + \frac{6,000}{30,000} \times 200,000}{500,000 + 300,000 + 200,000}$$

$$= \frac{(50,000 + 50,000 + 40,000)}{1,000,000} = 14\%$$

5440 Payment Error Rate Confidence Intervals

Confidence intervals are important in aiding a State in determining if the Federally mandated minimum sample sizes are sufficient for their analysis needs. The confidence interval for the estimate of the payment error rate is interpreted in such a way that the true (but unknown) payment error rate is expected to fall

within the stated confidence interval a specified percentage of the time (e.g., 95%, 90%, 80%), depending on the level of confidence desired. The following section shows how to construct confidence intervals for each stratum's payment error rate and for the program-wide payment error rate. Both will necessarily involve an analysis of the relationship between the amount of dollars in error for a given case and the dollars paid for that case. Therefore, it will be necessary to supplement data from Federal Reports with case-by-case data contained in the MQC Review Schedules.

5441 The Computation for a Given Stratum

The following notation is appropriate for any given stratum. A later section will deal with how to combine the precision levels across all strata.

Let n = the number of cases for which reviews were completed in the stratum of interest over the six-month period (see Item IV of Table IA).

d_i = dollar value associated with the ith case in the sample (i = 1,2,..., n; see Part VII of the Review Schedule: Summary of Claims Processing Errors, Item D). Note that the sum of d_i's in the sample is equal to z_i shown in Section 5430.

u_i = the total unduplicated dollars in error for ith case (i = 1,2,..., n; this is Item F, Part VIII, of the Review Schedule entitled "Summary of Payment Errors"). Note that the sum of u_i's in the sample is equal to y_i shown in Section 5430.

Note that

$$\frac{\bar{u}}{\bar{d}} = y_i/z_i$$

Then, the steps to follow in computing the level of precision and the confidence interval on the stratum payment error rate are:

First, compute the sample means of the unduplicated dollars in error per month, and the dollars paid per case per month. Keep in mind that the sample mean is simply the sum of observations divided by the number of observations. Denote this by $\bar{u}$ and $\bar{d}$. Next, compute the sample variances of the above quantities, where the sample variances of n observations are given by:

$$s_u^2 = \frac{1}{n-1} \sum_{i=1}^{n} u_i^2 - \frac{1}{n(n-1)} \left(\sum_{i=1}^{n} u_i \right)^2$$

$$s_d^2 = \frac{1}{n-1} \sum_{i=1}^{n} d_i^2 - \frac{1}{n(n-1)} \left(\sum_{i=1}^{n} d_i \right)^2$$

Denote these respectively by s_u^2 and s_d^2. Also compute the sample covariance between the dollars in error and the value of dollars paid, namely:

$$s_{ud} = \frac{1}{n-1} \sum_{i=1}^{n} (u_i \cdot d_i) - \frac{1}{n(n-1)} \left(\sum_{i=1}^{n} u_i \right) \cdot \left(\sum_{j=1}^{n} d_j \right)$$

Then compute: $s^2 = (s_u^2 - 2(\bar{u}/\bar{d})\, s_{ud} + (\bar{u}/\bar{d})^2 \cdot s_d^2)/\bar{d}^2$

The level of precision afforded by the sample of size n on the stratum unduplicated payment error rate, at the confidence level of 95%, is $1.96\ s/\sqrt{n}$.

The 95% confidence Interval for R_i is given by:

$$\bar{u}/\bar{d} \pm 1.96\ s/\sqrt{n}$$

5441.1 Numerical Illustration of the Confidence Interval for the Stratum Payment Error Rate

For ease of illustration, suppose that for a given stratum there were only 4 cases in the six-month sample. Further, suppose these cases, together with their dollar error amounts and paid amounts for their month of service, are respectively:

Case No.	Total Unduplicated Dollar Error for Each Case	Total Dollars Paid for Each Case
1	$0 = u_1$	$\$30 = d_1$
2	$\$10 = u_2$	$\$100 = d_2$
3	$0 = u_3$	$\$20 = d_3$
4	$\$6 = u_4$	$\$10 = d_4$

Step 1: $\bar{u}$ = average dollars in error per case = $\$16/4 = \$4$

Step 2: $\bar{d}$ = average dollar value of case = $\$160/4 = \$40$.

Then the best estimate of the stratum payment error rate is 4/40 = 10%.

Step 3: s_u^2 = sample variance of dollars in error per case per month $= 1/3\left[(0)^2 + (10)^2 + (0)^2 + (6)^2\right] - \frac{1}{4(3)}(0 + 10 + 0 + 6)^2 = 24.$

Step 4: s_d^2 = sample variance of the dollar value of a case per month is $= 1/3\left[(30)^2 + (100)^2 + (20)^2 + (10)^2\right] - \frac{1}{4(3)}[(30 + 100 + 20 + 10)^2] = 1{,}666.667$

Step 5: s_{ud} = sample covariance between dollars in error and value of case = $1/3 \left[0(30) + 10(100) + 0(20) + 6(10)\right] - \frac{1}{4(3)} (0 + 10 + 0 + 6)\ (30 + 100 + 20 + 10)$
= 140

Step 6: $s^2 = (s_u^2 - (2\bar{u}/\bar{d}) \cdot s_{ud} + (\bar{u}/\bar{d})^2 \cdot s_d^2)/\bar{d}^2 =$

$[24 - 2(.1)(140) + (.1)^2(1,666.667)]/(40)^2$

$= .0079$

$s =$ .089. At the 80% level of confidence, the confidence interval on the stratum unduplicated payment error rate would be: $.1 \pm 1.28\ (.089)/(2) = (.043,.157)$.

Therefore, with only 4 cases, the payment error rate for the stratum would be estimated to be 10%, and there is 80% chance that the payment error rate is somewhere between 4.3% and 15.7%. At the 95% level of confidence, the confidence interval would be:

$$.1 \pm 1.96\ (.089)/(2) = (.013,.187).$$

The levels of precision will be much better as the sample size is increased from the hypothetical size of 4 to numbers in the hundreds; the level of precision can be shown to improve as the square root of the sample size.

5442 Confidence Intervals and Levels of Precision for the Program-Wide Unduplicated Payment Error Rate

As illustrated in Section 5430, the estimate of the program-wide payment error rate was the weighted sum of the payment error rates for each stratum, the weights being the respective percentage of Medicaid payments contained in each stratum.

For each stratum, an estimate of the standard error of the payment error rate has been

calculated in Section 5441. This will be used, therefore, together with the payment weighting factors, to compute the confidence interval on a program-wide basis.

Upon referring to Section 5441, the standard error of the stratum unduplicated payment error rate was given by $s/\sqrt{n}$, where s and n refer to the values for the given stratum. It is now necessary to generalize this notation to deal with several strata.

Let:

n_i = number of reviewed cases in the ith stratum for the six-month period (i = 1,2,3).

$\bar{d}_i$ = average dollar value of cases in the ith stratum (i = 1,2,3).

$\bar{u}_i$ = average unduplicated dollar amount of errors per case for cases in the ith stratum (i = 1,2,3).

D_i = average total Medicaid payments to the ith stratum for the six-month period (i = 1,2,3). See Table X.

s_i^2 = the variance estimate resulting from Step 6 in Section 5441 for the ith stratum, i.e., the formula for s_i^2 is given by:

$$s_i^2 = (s_{u_i}^2 - (2\bar{u}_i/\bar{d}_i) \cdot s_{u_i d_i} + (\bar{u}_i/\bar{d})^2 s_{d_i}^2)/\bar{d}_i^2$$

The estimate of the program-wide unduplicated payment error rate, as calculated in Section 5430 is:

$$R = \sum_{i=1}^{3} y_i/z_i \cdot D_i / \sum_{i=1}^{3} D_i = \frac{\sum_{i=1}^{3} \frac{\bar{u}_i}{\bar{d}_i} D_i}{\sum_{i=1}^{3} D_i}$$

Then, at the 95% level of confidence, the confidence interval on the program-wide unduplicated payment error rate is given by:

$$R \pm 1.96\sqrt{w_1^2 s_1^2/n_1 + w_2^2 s_2^2/n_2 + w_3^2 s_3^2/n_3} \qquad (5)$$

where $w_i = D_i/(D_1 + D_2 + D_3)$ $(i = 1,2,3)$. At the level of confidence of 90%, and 80%, the 1.96 in formula (5) is replaced respectively by 1.64 and 1.28.

For illustrative purposes, recall the earlier example in Section 5441.1 which resulted in an s^2 of .0079, $\bar{d}$ of 40, $\bar{u}$ of 4. The results for this stratum, denoted as stratum 1, yield $s_1^2 = .0079$, $\bar{d}_1 = 40$, $\bar{u}_1 = 4$. To make the results more realistic, suppose $n_1 = 100$ (instead of 4). For the other strata, assume the following:

$$s_2^2 = .01,\ \bar{d}_2 = 400,\ \bar{u}_2 = 40,\ n_2 = 300$$

$$s_3^2 = .04,\ \bar{d}_3 = 50,\ \bar{u}_3 = 7.5,\ n_3 = 200$$

Also suppose that 50% of the Medicaid dollars had been paid to beneficiaries in the first stratum, 30% to the second, and 20% to the third. That is:

$$w_1 = .5,\ w_2 = .3,\ w_3 = .2.$$

Then:

(a) The overall estimate of the program-wide unduplicated payment error rate, from the 600 cases, would be:

$$R = .5(4/40) + .3(40/400) + .2(7.5/50) = .11$$

(b) The 95% confidence interval resulting from the 600 cases will be (from Formula 5):

$$.11 \pm 1.96 \left[(.5)^2(.0079)/(100) + (.3)^2(.01)/(300) + (.2)^2(.04)/(200)\right]^{\frac{1}{2}} = .11 \pm 1.96(.0055) = (.099, .121)$$

Therefore, there would be a 95% chance that the true payment error rate for the population on a program-wide basis is between .099 and .121.

5450 Dollar Impact of Agency Errors Relative to Beneficiary Errors: Illustration of the Use of Table IIA.

In analyzing Table IIA, "Dollar Value of Eligibility/Liability Errors by Source of Error" from Section 4000 (partially completed and shown on the next page), we can construct a bar chart displaying the relative contribution of the agency and beneficiaries to the error rate for each aid category and over all. From Table IIA, Item I in the MAO category (Column E), there are $4,400 for both eligibility errors and liability errors, of which 3000/4400 or 68.2% are due to agency errors, and 1400/4400 or 31.8% are due to beneficiary errors (Items II and III of Table IIA, under the MAO column). Similarly, the other percentages for the AFDC and SSI stratum are 25% agency, 75% beneficiary for AFDC; and 42.9% agency, 57.1% beneficiary for SSI.

In order to combine these results over the entire program, we can use Formula A of Section 4321 of the MQC Manual Reports, p. 46-47. This formula utilizes not only the average program dollars for each stratum, but also the dollars represented in the sample of cases reviewed and completed, and the dollars of liability/eligibility error by stratum. The formula for this particular application is:

$$\frac{\sum_{i=1}^{3} \frac{D_i}{d_i} \, y_i}{\sum_{i=1}^{3} \frac{D_i}{d_i} \, z_{var}}$$

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
HEALTH CARE FINANCING ADMINISTRATION

OMB NO. 66R0126
Expires Nov. 1979

Table IIA

MEDICAID QUALITY CONTROL: Dollar Value of Eligibility/Liability Errors by Source of Error

State _____ Reporting Period _____ to _____

LIABILITY/ ELIGIBILITY ERROR	Stratum																		Total (% only)		
	MAO						AFDC						SSI								
	Ineligible cases		Liability understated		TOTAL		Ineligible cases		Liability understated		TOTAL		Ineligible cases		Liability understated		TOTAL		Ineligible cases	Liability understated	TOTAL
	Amt A	% B	Amt C	% D	Amt E	% F	Amt A	% B	Amt C	% D	Amt E	% F	Amt A	% B	Amt C	% D	Amt E	% F	G	H	I
I. DOLLAR AMOUNT OF AGENCY AND BENEFICIARY ERRORS	1400	100%	3000	100%	4400	100%	1500	100%	2500	100%	4000	100%	300	100%	1100	100%	1400	100%	100%	100%	100%
II. DOLLAR AMOUNT OF AGENCY ERRORS	1000		2000		3000		500		500		1000		100		500		600				
A. Correct policy but incorrectly applied (10)																					
B. Wrong policy applied (20)																					
C. Failure to take indicated action																					
1. information disregarded or not applied (30)																					
2. follow-up on impending changes (40)																					
3. follow-up inconsistent or incomplete information (50)																					
4. verify where required by agency policy (60)																					
D. Reported information inaccurate (31)																					
E. Arithmetic computation (70)																					
III. DOLLAR AMOUNT OF BENEFICIARY ERRORS	400		1000		1400		1000		2000		3000		200		600		800				
A. Changes in circumstances not reported (01)																					
B. Information provided is not correct (02)																					
C. Information provided is incomplete (03)																					

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Where: z_{var} = dollars paid for a specific subset of the sample
y_i = dollars paid for any variable of interest

For example, from Table IIA, Item II (partially completed and illustrated on the previous page), the dollars of liability/eligibility error due to agency errors for the ith stratum are $3,000 for the MAO stratum (i = 1, Column E), $1,000 from the AFDC stratum (i = 2), and $600 for the SSI stratum (i = 3). Similarly, from Table IIA, Item 1, the total liability/eligibility errors are $4,400, $4,000 and $1,400 for the three strata respectively. Continuing from the earlier illustration of Table IA, Item II, the respective average program expenditure in each of the strata were given to be $10,000,000, $15,000,000, and $5,000,000, respectively; and from Item VIII, the dollar values represented in the sample of cases reviewed for each stratum are $12,000, $16,000 and $5,000. The overall percent of liability/eligibility dollars errors due to agency problems therefore is:

$$\left[\frac{10,000,000}{12,000} \times 3,000 + \frac{15,000,000}{16,000} \times 1,000 + \frac{5,000,000}{5,000} \times 600\right] \div$$

$$\left[\frac{10,000,000}{12,000} \times 4,400 + \frac{15,000,000}{16,000} \times 4,000 + \frac{5,000,000}{5,000} \times 1,400\right]$$

$$= \frac{(2,500,000 + 937,500 + 600,000)}{(3,666,667 + 3,750,000 + 1,400,000)} = \frac{4,037,500}{8,816,667} = 45.79\%$$

And, the program-wide percent of liability/eligibility dollar errors due to beneficiary errors would be 54.2% This information is recorded in the last column of Table IIA, Column I, and might be displayed in the following bar chart.

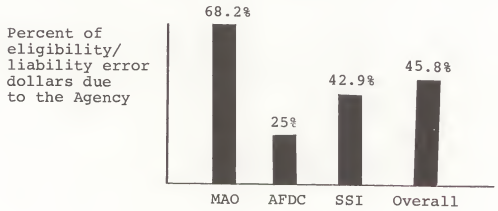

Table IIB
MEDICAID QUALITY CONTROL: Dollar Value of TPL and CP Errors by Source of Error

State _____ Reporting Period _____ to _____

THIRD PARTY LIABILITY (TPL)/CLAIMS PROCESSING (CP) ERRORS	Stratum						Total Percent Only C
	MAO		AFDC		SSI		
	Amount A	Percent B	Amount A	Percent B	Amount A	Percent B	
I. DOLLAR AMOUNT OF TPL ERRORS		100%		100%		100%	100%
A. Failure of certifying agency to identify TPL							
B. Failure of beneficiary to inform about potential TPL							
C. Failure of claims process screening for TPL							
D. Failure of state to pursue or investigate TPL leads							
II. DOLLAR AMOUNT OF CP ERRORS	3700	100%	2950	100%	630	100%	100%
A. Completeness of of claims (710)	100	2.7%	50	1.7%	90	14.3%	3.4%
B. Inpatient hospital services (720)							
C. Physician services (730)							
D. Long term care (740)							
E. Pharmacy services (750)							
F. EPSDT services (760)							
G. Other services (770)							

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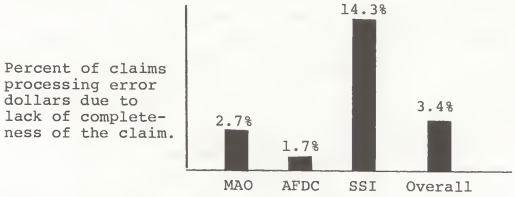
5460 Distribution of Dollar Amount of Claims Processing Errors by Service Type: Illustration of the Use of Table IIB

Analyze the data in Table IIB, "Dollar Value of TPL and CP Error by Source of Error." We can observe from Item II that the total dollars in error for the sample due to the MAO stratum for claims processing are $3,700, and that $100 of this is due to lack of completeness of claims. Similarly, we can see that the dollars in error for the other two strata are $2,950 and $50 for the AFDC stratum, and $630 and $90 for SSI stratum. From that, we can construct the bar chart displaying the percentage of claims dollars due to lack of completeness of the claim.



The overall program percent of claims processing error dollars due to lack of completeness of the claims uses the same formula as used previously in Section 5450. The computation is:

$$\left[\frac{10,000,000}{12,000} \times 100 + \frac{15,000,000}{16,000} \times 50 + \frac{5,000,000}{5,000} \times 90\right] \div$$

$$\left[\frac{10,000,000}{12,000} \times 3,700 + \frac{15,000,000}{16,000} \times 2,950 + \frac{5,000,000}{5,000} \times 630\right]$$

$$= \frac{(83,333 + 46,875 + 90,000)}{(3,083,333 + 2,765,625 + 630,000)} = \frac{220,208}{6,478,958} = .034 = 3.4\%$$

as shown in Column C of Table IIB.

5500 USE OF EXTENDED DATA BASE TO REFINE ESTIMATE OF THE PAYMENT ERROR RATE

As mentioned earlier, the basic data set consists of claims paid up to four months after the review month. After that point, the official claims review function will not be performed. However, since cases will be sampled during a six-month period, claims for cases sampled during earlier months will continue to be paid after the collection cutoff date. The extended data base, Table XI of Section 4000, consists of the payment amounts on such claims which may be used to develop a refined estimate of the payment error rate due to ineligibility errors.[1] Note that even though the number of cases stays the same, the confidence intervals on the payment error rates can change since they are a function of the type and payment levels of errors uncovered. Any use of the extended data base will have no impact on the case error rates or their confidence intervals. Another use of the data is to update the time lag between service and payment , which is important information for the State's budgeting functions.

It is important to note that any analysis that might be carried out using the extended data base needs to be performed for each stratum. The basic method of attack would consist of supplementing the monthly liability/eligibility payment error rates, obtained from the claims with a four-month or less lag (between the service month and the payment month) with the monthly liability/eligibility payment error rates associated with longer lags. Thus, in addition to the payment error rates associated with eligibility/liability from the basic data set, one has additional monthly payment error rates from the extended data base. Since there are different

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[1] Note that the refined estimate of the eligibility errors can be determined directly from the claims of the extended review period (even though the claims processing review ends after the 4th payment month); this follows since the eligibility or liability status of the recipient has been determined earlier and all that is needed is the dollar value of the claims in the extended period.

numbers of payment months associated with each service month, it is necessary to weight the results for each service month to take this into account. The stratum payment error rate associated with liability/eligibility for the first service month, therefore, will have a higher weight than that for the 6th service month. The weights involve the stratum program costs by service month and by the specific lag. Once the revised stratum payment error rate associated with liability/eligibility problems has been calculated, it can be integrated with the stratum's claims processing and third party payment error rates to arrive at the revised stratum payment error rate. This is done by adding to the revised liability/eligibility payment error rate the ratio of the total dollars paid in error for claims processing and third party resources for cases in the basic data set to the total dollars represented in the basic data set for the stratum of interest. Having done this for each stratum, the rates can then be combined to yield program-wide results using the same methods as was discussed in Section 5231.

5600 OTHER SUGGESTED ANALYSIS TECHNIQUES

5610 Correlation and Regression

Correlation analysis and multiple regression analysis are general statistical techniques through which one can analyze the relationship between a dependent or criterion variable, e.g., whether or not a case is in error, average utilization costs per month, etc., and a set of independent or predictor variables, e.g., whether a beneficiary has earned income, whether a beneficiary has a bank account, length of time on eligibility rolls, length of time since last review, etc. It can be viewed both as a descriptive test through which the linear or non-linear dependence of one variable on others is summarized and decomposed, and as an inferential test by which the relationships are evaluated from an examination of the sample data.

In addition to being able to focus on the prediction of the dependent variable and its overall dependence on a set of independent variables, we may wish to examine the influence of the characteristics of, say, "having a bank account" on the likelihood of the case being ineligible. However, a simple regression of "bank account" related to ineligibility will not provide an appropriate answer, since having a bank account may be confounded with size of earned income, length of time on welfare, marital status, etc. In other words, the higher the earned income or the lower the length of time on assistance, the more likely one is to have a bank account. Also, the characteristics related to income or length of time on assistance themselves affect the likelihood of a case being ineligible. Therefore, we may want to examine the likelihood of a case being in error, while controlling for variation in income and time on assistance. This can also be performed by means of regression and correlation analysis.

It is worth noting that quite different results in terms of the importance of a given variable can be obtained if the regression is performed on one independent variable or confounded with the effects of other correlated independent variables.

The general form of the linear regression is:

$$Y = A + B_1X_1 + B_2X_2 + \ldots B_kX_k \text{ or } Y + AX_1^{B_1} \cdot X_2^{B_2} \ldots X_k^{B_k}$$

where Y represents the dependent variable, e.g., whether or not a case is in error, the X's being the independent or predictor variables, and the A and B's being the regression coefficients (which are the key outputs of the analysis).[1] The A and B coefficients are selected in a way so that the sum of the squared residuals, i.e., the square of the difference between the prediction of Y and the actual values of Y, is minimized. In addition to the functional form, one can determine the "strength" of the relationship, i.e., the extent to which the observations fit the derived functional form. This measure of fit is called the coefficient of determination, denoted R^2, and gives the proportion of variability in the criterion or dependent variable Y that is explained by the independent variables X_i (i = 1,2,...K). A reference is Applied Regression Analysis by Draper and Smith, McGraw-Hill Company.

5611 Illustration of Regression Analysis

One of the useful purposes of regression analysis, in contrast to the earlier demonstrated use of Chi-Square analysis (which can detect only if there is an association between various classes

[1] Linear regression can still be utilized for the above multiplicative model by simply taking the logarithms on both sides of the equation.

of variables), is to determine the functional form of the relationship. Consider the type of summary information contained in Table IXA, entitled "Case Characteristics for Both Cases with and Cases Without Eligibility/Liability Errors" dealing with the number of persons in households (Item IV) and the type of summary information contained in Table IA, "Statistical Summary," Item VIII, fourth column. From these summary tables one might conclude, for example, that the average dollar payment per case per month is $60.75; and that 5% of the cases have one member, in the household, 10% have two, 15% have 3,...,5% have 10 or more. However, if one is interested in developing the functional form, relating cost/per case to the number of persons in the household, one must utilize the detailed information contained in the Review Schedules, i.e., the dollar value associated with a given case (see VII, Item D), and the number of persons in household (see II, Item K). Suppose that for 5 randomly drawn cases, one obtains:

Dollar Payment Per Case	Number of Persons in Household
$30	1
$30	2
$70	4
$60	5
$120	8

solving the regression equations yields:

$$D = 10 + 13P$$

The estimate of the dollar payment per case = 10 +13x(number of persons in household) is an estimate of the linear relationship between the variables.

Another possible application for the regression technique is to help in studying how

long an error persists as a function of the error type, redetermination schedule, depth of review, etc.

An example of the use of correlation analysis is to determine if third party error amounts are correlated with liability error amounts. An example of this is to use the information on the Review Schedule, Part IV, Item R, representing dollars of liability error for the case, with the information in Part VI, Item J, showing the dollars in error for third party liability. The correlation coefficient (called the Pearson product moment correlation coefficient) measures the strength and the direction of the association. If we have N observations, then the estimate of Pearson's product moment correlation coefficient is:

$$r = \frac{\sum_{i=1}^{N} (X_i - \overline{X})(Y_i - \overline{Y})}{\sqrt{\sum_{i=1}^{N} (X_i - \overline{X})^2 \cdot \sum_{i=1}^{N} (Y_i - \overline{Y})^2}}$$

where x_i = ith observation of one variable

y_i = ith observation of second variable

and $\overline{X}$, $\overline{Y}$ denote the means of the respective variables.

This value of r will always be some number between -1 and +1 and measures the degree of linear association between the two variables. If r equals 1, then all pairs of x and y fall on a line with a positive slope; if r equals -1, all pairs of x and y fall on a line with a negative slope, and if r equals 0, then there is no linear relationship.

5620 Analysis of Variance

Analysis of variance, sometimes referred to as ANOVA, is a statistical technique for studying the effects on a given dependent variable of one or more factors. If one factor is involved, such as the impact of cases per case technician on the agency case error rate, then the analysis is called a one-way analysis of variance. If one is interested in the simultaneous effects of n factors, say experience and educational level of technicians in addition to workload, the analysis is referred to as an n-way analysis of variance.

The basic thrust of the technique is to decompose the total sample variability associated with all the observations, this variability being the sum of the square of the differences in the observed values from the overall mean. This variability is partitioned into the components due to: 1) variations between the different factors; 2) their possible joint effects; and 3) the variation within the factors.

A category may be defined as situations where the number of cases per case technician is between 5 and 8 per month. If the variability associated with the given factor being analyzed is large compared to the variation within a given category, then the factor is deemed to have a significant impact. Examples include:

1) Is the experience and education level of case technicians important in reducing the payment error rate?

2) Do the factors "Spouse not on Medicaid," "Married more than once," and "No face to face initial interview" affect the case error rate?

3) Do certain groups such as "AFDC," "nursing home recipients," and "MAO-others" have a higher probability for eligibility/liability errors?

An illustration of a one-way analysis of variance is the test of significance of the impact of the individual aid category on the eligibility/liability error dollars per case. The categorical relationship, i.e., SSI, AFDC, or MAO can be obtained from the information in Part II, Item H of the Review Schedule. Also Part VIII, items B and C show the dollars of elibibility/liability errors for the particular case. The factor, "aid category," is divided into 3 segments, SSI, AFDC and MAO, the dependent variable being the eligibility/liability dollars in error per month per case.

Suppose one had the following results from a random sample of 15 Review Schedules:

Aid Category SSI		Dollars in Error
Observation	1	$11 = X_{1,1}$
	2	$9 = X_{1,2}$
	3	$13 = X_{1,3}$
	4	$11 = X_{1,4}$
Aid Category AFDC		
Observation	1	$25 = X_{2,1}$
	2	$28 = X_{2,2}$
	3	$31 = X_{2,3}$
	4	$27 = X_{2,4}$
	5	$30 = X_{2,5}$
	6	$33 = X_{2,6}$
Aid Category MAO		
Observation	1	$19 = X_{3,1}$
	2	$23 = X_{3,2}$
	3	$19 = X_{3,3}$
	4	$21 = X_{3,4}$
	5	$20 = X_{3,5}$

The first step is to compute the grand mean or average dollars in error, $\bar{x} = \Sigma\Sigma x_{i,j}/15$ (in this case it is 21.33) and the total sum of squares which is 845.33. This is equal to $\Sigma\Sigma(x_{i,j} - \bar{x})^2$. The "between sample" category variation, given by $SS_B = \Sigma N_i(\bar{x}_i - \bar{x})^2$ where N_i denotes the number of observations in the ith category and $\bar{x}_i$ is the mean of the observations in the ith category, is computed to be 61.2. The second component, termed the "within category" variation is computed as

$$SS_w = \sum_{i=1}^{3} \sum_{j=1}^{N_i} (x_{i,j} - \bar{x}_i)^2$$ and is 784.13.

The "between category variation" is larger than the "within category variation" and so one could hypothesize that the factor, "aid category " is apparently important in determining the error rate for eligibility/liability. To test this hypothesis, calculate the ratio:

$F = [SS_B/(\#\text{ of categories} - 1)]/[SS_w/(\#\text{ of observations} - \#\text{ of categories})]$ with the number of categories - 1, and number of observations - the number of categories, as the degrees of freedom for the numerator and denominator respectively to determine how large is statistically large. For the above example, the value of the ratio is 77 whereas the 95th percentile of the F distribution (which can be found in any statistics text) with 2 and 12 degrees of freedom is 3.89. Since 77 is larger than 3.89, one can conclude at the 5% level of significance that the factor, "aid category," does have a very significant impact. A reference is The Analysis of Variance by H. Scheffe, Wiley Publications.

5630 Discriminant Analysis

Discriminant Analysis is a technique used to statistically distinguish between two or more

groups of cases, i.e., those cases which are likely to have ineligible members, those cases which are likely to have claims over $100, that set of Medicaid beneficiaries who are likely to have some form of third party resources, etc. To distinguish between the groups, the analyst selects a collection of discriminating variables that measure characteristics on which the groups are expected to differ. For example, the discriminating variables might be presence of earned income, other pensions, other income, length of time since most recent action, number of children, number of other persons in household, extent of real property, amount of liquid assets, etc. It is recognized that no single issue will perfectly differentiate between the various groups; but by taking several issues and mathematically combining them, one hopes to find a single dimension or scale on which beneficiaries with a high probability of being ineligible will be clustered at one end, and low risk beneficiaries at the other end.

Discriminant analysis attempts to do this by forming one or more linear combinations of the discriminating variables. The functions are of the form:

$D = d_1Z_1 + d_2Z_2 + \ldots d_pZ_p$ where D is the score for the discrimant function, d's are the weighting coefficients and the Z's are standardized values of the p discriminating variables used in the analysis. The function is formed in a way so as to maximize the separation of the group. The discriminant function could be used to permit classification of new cases to determine if the case warrants special review and scrutiny. A reference is Multivariate Statistical Methods by Morrison, McGraw Hill.

5640 Factor Analysis

The single most distinctive feature or characteristic of factor analysis is its data reduction capability. The basic technique allows one to discern whether some underlying

pattern of relationships exists such that the data may be "rearranged" or "reduced" to the most important smaller set of factors or components. These may then be taken as source variables, accounting for the observed interrelations in the data. A key input to factor analysis is some type of correlation matrix interrelating the many variables to be considered. The key use of the technique is in an exploratory use, i.e., the detection of patterns of variables with a view towards discovery of new concepts and a possible reduction of data. A reference for details might be R.J. Rummel's Applied Factor Analysis, Northwestern University Press, Evanston, Ill., 1970.

The key types of factors that one might consider for data reduction include:

1) demographic data, e.g., population in district, urban, rural designation, etc.

2) workload characteristics, e.g., total caseload and mix, backlog, county dollar volume by type of service, etc.

3) case technician characteristics, e.g., turnover rate, average experience, average education per trainee, average absentee rate, etc.

4) office policies and procedures, e.g., number of case technicians, divisions responsible for redetermination scheduling, case record management, case assignment policies, etc.

5) facility characteristics, e.g., number of case technicians and room, percentage of private interviews, access to calculators and manuals, availability of forms and office supplies, etc.

It might be mentioned that some States have found some of the above factors very helpful in developing corrective action plans tailored to each county's or local agency's individual needs. The type of corrective actions have included:

1) changing District Office conditions to reduce the absentee rate

2) increasing staff to reduce the backlog of applications and overdue determinations

3) determining the role of experience and education in case technician's effectiveness.

5650 Methods for Tracking and Forecasting the Change in the Payment Error Rates or Case Error Rates over Time

Trends in error rates are useful in evaluating the impacts of corrective actions after they have been implemented since they provide useful feedback concerning the effects of changes. For this reason, error rates for each stratum and for each of the types of error as well as the program-wide error rate may be charted monthly, organizing the results according to the review month or completion month. However, since the monthly samples for a given review month are small, random fluctuation can make it difficult to determine if there is any significant underlying trend.[1] There are various objective means to do this including non-parametric methods such as the Sequential Sign Rank Test. There are also smoothing techniques such as exponential smoothing which enable forecasts to respond quickly to changes, as well as regression analysis. Another method of tracking changes in error rates is the moving average. The moving average is

[1] In addition to the sample sizes there is the problem that occurs associated with these cases from a given service month which have not yet been completed; the problem is that these cases tend to be difficult cases with more errors than normal. Thus, the incomplete monthly results may underestimate the eventual review month error rate.

computed by averaging the monthly error rates over some cyclical period of time (e.g., the six months of the review period). It has the advantage of ignoring normal cyclical fluctuations while being simple to compute. A reference for trend or tracking techniques is Statistical Quality Control, Grant, E. L., McGraw-Hill, 1964.

5700 ADDITIONAL EXAMPLES FOR ANALYSIS

5710 Is the Likelihood of Third Party Resources the Same for MAO Cases as for AFDC Cases: Illustration of the Use of Table V

Examine Table V, "Number of Sample Cases by Third Party Liability Status," partially completed and shown on the next page. From Items III,IV, V, and VI, one observes that 50 of the 300 cases in the MAO stratum have possible third party resources available, whereas 25 of the 200 AFDC cases have possible third party resources. To determine if more scrutiny for TPL resources is warranted for one stratum versus the other, test if

$\hat{p}_1$ and $\hat{p}_2$ are significantly different. The test statistic is:

$$T = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{(\Pi(1-\Pi)\ (1/n_1 + 1/n_2)}}$$

where $\hat{p}_1 = 50/300 = .167$, $n_1 = 300$,

$\hat{p}_2 = 25/200 = .125$, $n_2 = 200$

$$\Pi = \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2} = \frac{300(.167) + 200(.125)}{500} = .150$$

($\hat{p}_1, \hat{p}_2$ equal the respective likelihoods of third party resources being available for MAO cases and for AFDC cases.)

Therefore, the quantity T is:

$$\frac{.042}{\sqrt{(.15)(.85)(1/300 + 1/200)}} = 1.29$$

Since the threshold at the 5% level of significance is 1.96, we cannot reject the null hypothesis that there is no difference in the likelihood of TPL resources for a given case of either strata, and thus no difference in the level of effort to search for TPL resources appears warranted.

Table V
MEDICAID QUALITY CONTROL: Number of Sample Cases by Third Party Liability Status

State _____ Reporting Period _____ to _____

THIRD PARTY LIABILITY STATUS	Stratum						Total Percent Only
	MAO		AFDC		SSI		
	Number A	Percent B	Number A	Percent B	Number A	Percent B	C
I. ALL SAMPLE CASES FOR WHICH REVIEWS HAVE BEEN COMPLETED	300	100%	200	100%		100%	100%
II. NO TPL PRESENT	250		175				
III. TPL PRESENT–NO CLAIMS FOR THE REVIEW MONTH	10		5				
IV. TPL PRESENT–DOLLAR AMOUNT VERIFIED	25		10				
V. TPL UNCERTAIN–THIRD PARTY NOT VERIFIED	5		5				
VI. TPL PRESENT–DOLLAR AMOUNT CANNOT BE DETERMINED	10		5				

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5720 What is the Relationship of Date of Most Recent Error to Date of Most Recent Action: Illustration of the Use of Table IXB

An important issue is to determine, for those cases where either eligibility or liability errors are present, whether the date of the most recent action affects the date of the error. If, for example, one learned that almost all errors occurred after the most recent action (and not before or coincident), then one would feel confident that the application and redetermination process was working well but perhaps needs to be performed more often. However, if one learns that most errors occurred before or coincident with the latest action, then the application/redetermination process is flawed and needs to be improved.

Consider the numerical values displayed in Table IXB entitled "Case Characteristics - Eligibility/Liability Error Cases Only," partially completed and shown on the next page. The best estimate of the fraction of eligibility/liability error cases associated with errors before or coincident with the date of most recent action is .10. The 95% confidence interval for this fraction, based on the 100 error cases, is given by:

$$\hat{p} \pm 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

or

$$.10 \pm 1.96\sqrt{\frac{(.10)\ (1-.10)}{100}} = .10 \pm .059 = (.041,.159)$$

Therefore, we can conclude that with less than 5% chance of error, the rate for errors before or coincident with redetermination is between .041 and .159.

5730 Estimates of Stratum Universe Errors: Illustration of the Use of Table X

Table X, partially completed for illustrative purposes here, displays the number of cases by

OMB NO. 66R0126
Expires Nov. 1979

Table IXB
MEDICAID QUALITY CONTROL: Case Characteristics—Eligibility/Liability Error Cases Only (MAO Stratum Only)

State _____ Reporting Period _____ to _____

CHARACTERISTIC	Cases With Eligibility/Liability Errors	
	Number A	Percent B
I. AGE OF ERROR—TOTAL		100%
A. 3 months or fewer		
B. 4 to 6 months		
C. 7 to 9 months		
D. 10 to 12 months		
E. 13 or more months		
II. RELATIONSHIP OF DATE OF MOST RECENT ERROR TO DATE OF MOST RECENT ACTION—TOTAL	100	100%
A. Before	8	
B. Coincident	2	
C. After:	90	
1. 3 months or fewer	40	
2. 4 to 6 months		
3. 7 to 9 months		
4. 10 to 12 months		
5. 13 or more months		

This report is required by law (42 CFR 450.25(e)).
Failure to report can result in a noncompliance determination.

Table X
MEDICAID QUALITY CONTROL: Universe Data by Stratum or Substratum

Stratum _____

Substratum _____

State _____ Reporting Period _____ to _____

MONTH	NUMBER OF CASES A	DOLLAR PAYMENTS B
1. April	50,000	1,000,000
2. May	45,000	900,000
3. June	60,000	1,100,000
4. July	50,000	1,000,000
5. August	45,000	800,000
6. September	40,000	800,000

This report is required by law (42 CFR 450.25(e)).
Failure to report can result in a noncompliance determination.

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month for a given stratum and the associated dollars paid during the review period.[1] Suppose one has earlier calculated for a given stratum a case error rate of 5% and a stratum payment error rate of 8%. Then, since the average monthly caseload for the stratum is (50,000 + 45,000 + 50,000 + 60,000 + 45,000 + 40,000) /6 = 48,333, one can infer that in a typical month during the six-month period, there were an average of 2,417 cases in error. Also, for the stratum of interest, the total dollar payments were equal to ($1,000,000 + $900,000 + $1,100,000 + $1,000,000 + $800,000 + $800,000) or $5,600,000. As a result, the estimate of the total dollars paid in error for the six-month period for the stratum of interest is .08 x $5,600,000 = $448,000.

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1 Note that the universe of dollars used here is not the universe of dollars which has been sampled. Hence, the estimate of total dollars misspent must be considered a close approximation.

APPENDIX A

CHI-SQUARE TABLE

FOR USE IN TEST OF SIGNIFICANT RELATIONSHIP BETWEEN TWO FACTORS

(5% level of significance)

To determine if the concentration of errors is statistically significant use the following table. If the computed value of x^2 is greater than the critical value x_c^2 for the proper degrees of freedom in the table, the association is significant.

(Number of rows - 1) x (Number of columns - 1)	Critical Value of Statistic, x_c^2
1	3.84
2	5.99
3	7.81
4	9.49
5	11.1
6	12.6
7	14.1
8	15.5
9	16.9
10	18.3
11	19.7
12	21.0
13	22.4
14	23.7
15	25.0
16	26.3
17	27.6
18	28.9
19	30.1
20	31.4
21	32.7
22	33.9
23	35.2
24	36.4
25	37.7
26	38.9

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